Children's selection of emojis to express food-elicited emotions in varied eating contexts

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

Research Article

Children's selection of emojis to express food-elicited emotions in varied eating contexts

Julia Sick, Sara Spinelli, Caterina Dinnella & Erminio Monteleone

University of Florence, Department of Agriculture, Food, Environment and Forestry (DAGRI), Via Donizetti 6, 50144 Florence, Italy

*Corresponding author.
E-mail address: julia.sick@unifi.it (J. Sick)

Abstract

Emojis were suggested for children to be used to measure food-elicited emotions. The present study was aimed to explore the appropriateness of emojis to describe pre-adolescents' emotions elicited by foods recalled in relation to different evoked eating contexts and to explore related age- and gender differences. Fifty-five boys and forty-one girls aged 9-13 participated to the study. First, subjects were asked to recall, by means of an open-ended question, the foods they had in specific eating contexts: "Most liked food" and "Most disliked food", "Breakfast", "Dinner", "Snack", "Birthday" and "Novel food". Then, they were asked to select the emojis appropriate to describe their feelings for the context-related foods by selecting from a list of 92 facial emojis (CATA method). Emojis selected by more than 20% of children in at least one eating context qualified as food-related. In total, 46 emojis resulted as appropriate to describe emotions in different eating contexts. Pre-adolescents used mainly positive emojis, except for the context "Most disliked food", where mainly negative emojis were used. Most food-related emojis resulted from "Most liked food" and "Most disliked food", but the context "Birthday" also added some context-specific emojis. The number of selected emojis varied across evoked eating contexts eliciting different foods. Age and gender significantly affected emoji selection across and within foods elicited by varied eating contexts, with girls and 9-11-year-old subjects selecting some emojis more frequently across all contexts, but also within contexts. The approach used in the present study has the potential to be used for the development of a food-related emotion measurement tool for pre-adolescents. Future research aimed at interpreting the meaning of facial emojis is needed and should consider age- and gender differences.

Keywords

Children, CATA, Emotions, Emoji, Food, Eating context.

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

1. Introduction

1.1. Background

Emotions have been shown to play an important role in children's food preference assessment as they can help to better discriminate between food products compared to the sole use of liking measurements and to better predict product performance (Schouteten, Verwaeren, Lagast, Gellynck, & De Steur, 2018). In addition, investigating children's emotional responses to foods is important because emotional profiles can help to understand drivers of food choice in order to promote healthier and tastier foods (Jiang, King, & Prinyawiwatkul, 2014; Macht, 2008), but in order to measure food-related emotions, the development of a reliable emotion measurement tool is required (Cardello & Jaeger, 2016). Self-reported questionnaires using words have been the most common method for the evaluation of emotional responses to food products (see Meiselman, 2016; Spinelli & Monteleone, 2018) with promising results to be used with children (De Pelsmaeker, Schouteten, & Gellynck, 2013; Gallo, Swaney-Stueve, & Chambers, 2017b; Jervis, Jervis, Guthrie, & Drake, 2014).

More recently emojis were shown to have the ability to describe emotional responses and to discriminate between food products both in adults (Jaeger, Lee, et al., 2017, 2018; Jaeger, Roigard, & Ares, 2018; Jaeger, Vidal, Kam, & Ares, 2017) and children (Gallo et al., 2017b; Schouteten, Verwaeren, Gellynck, & Almli, 2019; Schouteten et al., 2018; Swaney-Stueve, Jepsen, & Deubler, 2018). Emojis are small icons used in digital communication to express emotions/feelings (Kaye, Malone, & Wall, 2017; Wikipedia, 2019) that are commonly used on various social media platforms and smartphones worldwide (Lu et al., 2016). The use of social media and digital communication is gaining more and more popularity among young adults and children (Commonsensemedia, 2016), which makes emojis a medium that is already familiar to them. Emojis could have the advantage to offer a non-verbal way of conveying meanings that otherwise cannot be expressed with words or that would be expressed differently. This can also be an advantage for younger children with reduced verbal skills and limited vocabulary, but also for shy children that struggle to communicate information about their feelings. The use of emojis implies a game-like situation and seems to be an easy and intuitive tool to measure emotions/feelings in children (see Laureati & Pagliarini, 2018).

Intensive research on emojis in adults has been conducted by Jaeger and colleagues showing that some emojis can discriminate between food stimuli, which included different samples of muesli bars and popcorn as tasted stimuli and milk, water, red wine and chocolate as written stimuli (Jaeger, Roigard, et al., 2018; Jaeger, Vidal, et al., 2017). However, as children differ from adults in many developmental aspects, emoji lists have to be age-appropriate, hence, they need to be specifically developed or adjusted for children. When assessing emotions through self-report measures, it is inevitable to consider the children's age in the selection of emotions as the developmental status affects the way the children respond to self-report measures (Zeman, Klimes-Dougan, Cassano, & Adrian, 2007). In contrast to younger children (5-6 y.o.), older children (8-12 y.o.) have already a more developed ability to conceive that multiple emotions can be experienced concurrently (Larsen, To, & Fireman, 2007). Pre-adolescents (aged 9-13) develop an increased drive for autonomy (Eccles, 1999) and an enhanced

developmental ability to express themselves appropriately when responding to self-reported questionnaires (see Laureati & Pagliarini, 2018). Additionally, pre-adolescents start to become more familiar with social media and digital communication, with increasing familiarity with age; 23% of children aged 8-12 have a social media account, in contrast to 80% of children aged 13-18 (Commonsensemedia, 2016; Howard, 2018). This steep rise of social media usage in the transition from early to late pre-adolescence and adolescence could affect how familiar emojis are to children and the way in which they use them.

Although emojis seem to be a promising tool to be used in pre-adolescent's emotion measurement in response to food, until now only a limited number of studies investigated pre-adolescent's food-elicited emotions using emojis (Gallo, Swaney-Stueve, & Chambers, 2017a; Gallo et al., 2017b; Schouteten et al., 2019, 2018; Swaney-Stueve et al., 2018). Additionally, Schouteten et al. (2018) pointed out that it is still unclear how to use emojis to describe food products with pre-adolescents, especially how they should be selected and which number of emojis is appropriate to use.

Due to the high number and diversity of available emojis, researchers followed different procedures to develop emoji lists and scales and to select the appropriate number of emojis to be tested in a reliable tool for food-related emotion measurement. The selection of emojis ranged from conducting focus groups with 8-11 y.o. children (Gallo et al., 2017a) to relying on pre-defined emoji lists of former studies based on adults (Schouteten et al., 2018) and on pre-tests of a pre-defined list based on both responses of adults and 8-11 y.o. children (Schouteten et al., 2019). Gallo et al. (2017a) developed an emoji list originating from focus groups with a total of 17 children aged 8-11, who were asked how they felt about their favorite, least favorite and "just okay" food in different eating contexts. The facial emojis used in the study were obtained from an internet data base and pre-selected by a researcher to limit emojis that might not be relevant when evaluating food. Based on children's use of emojis through discussion and activities, a list of 38 emojis was considered appropriate for further emotion testing with children aged 8–11, while other lists comprised of 28 (Gallo et al., 2017b) or even 20 emojis (Schouteten et al. 2019) in the case of a product-specific list.

The papers reported above have the merit of pointing out the need of specifically developing an emoji list that can be used to measure food-related emotions with an age-specific group of children. However, given that there is a growing number of newly developed facial emojis, it is important to consider the wide spectrum of emojis available that have the potential to measure food-elicited emotions in children. This means that it is difficult to rely on pre-existing lists when an emoji-based tool measuring food-related emotions has to be developed for a specific age group of children. In addition, cross-cultural differences could be expected between children of different countries as it was shown that emoji usage, preferences and their meanings can differ across countries (Barbieri, Kruszewski, Ronzano, & Saggion, 2016; Lu et al., 2016).

Another point that needs to be considered is which and how food items should be presented to children to select food-related emojis. As emotions are much influenced by interactions

between the person and the environment, it is important to consider contextual aspects in emotion research with children (Zeman et al., 2007). Foods evoke associated memories of previous eating occasions and are thus linked to emotions experienced on these occasions (Köster & Mojet, 2015), which highlights the importance of including situational factors when evoking food-related emotions.

In addition to the general aspects presented above, a more specific research question in selecting food-related emojis for consumer testing with children is: Is there a difference in the use of food-related emojis in children of similar age? This question is particularly relevant in studies conducted with pre-adolescents, since even within a limited age interval (9-13 years) subjects may have profound changes in their social interaction (Eccles, 1999). For example, during pre-adolescence, children make a transition from primary to secondary school, which means a change of their social environment leading to important developmental advances such as gaining more self-esteem and individuality (Eccles, 1999). Differences in emotion expression have been previously found across childhood from toddler/preschool age into adolescence (Chaplin & Aldao, 2013).

Furthermore, attention has to be paid to differences in emotion expression and non-verbal communication between genders (Kring & Gordon, 1998). A meta-analytic review on emotion expression in children demonstrated that boys and girls differed in emotion expression. Girls expressed more positive emotions, which became even more evident with increasing age into adolescence compared to boys. Girls also showed more internalizing emotions (e.g. sadness and fear), whereas boys expressed more externalizing emotions (e.g. anger) (Chaplin & Aldao, 2013). Similar findings were shown in adults (Fischer, Rodriguez Mosquera, Van Vianen, & Manstead, 2004). Women tend to use more emojis in their digital communication than men (Chen et al., 2018), which could be explained by their increased emotion expression. However, no gender differences were found in a study investigating if emoji questionnaires can be used equally across gender and age groups in adults when characterizing stimuli with emojis with Chinese and New Zealander participants (Jaeger, Xia, et al., 2018). However, more research is needed to clarify if there are gender differences in emoji questionnaires in pre-adolescents.

The present study was aimed to explore the appropriateness of emojis, including facial emojis that have never been studied before with pre-adolescents in this context, to describe pre-adolescents' emotions elicited by foods recalled in relation to different evoked eating contexts. Furthermore, the study aimed at exploring related age- and gender differences in how emojis are selected for each evoked eating context. The purpose of this study is to select a list of emojis used by pre-adolescents to describe their food experience to be used in further studies with self-report measures (questionnaires).

2. Methods

2.1. Participants

Ninety-six subjects (55 boys) aged 9-13 (mean age±SD of 10.9±1.5, in both gender groups) were recruited in primary and secondary schools in Florence area, Italy. Children were grouped into two age groups of 9-11-year-olds (24 girls and 31 boys) attending primary school and 12-13-year-olds (17 girls and 24 boys) attending secondary school. Only children who returned a signed consent form from their parents and who agreed to voluntarily participate in the study by signing their own consent form were allowed to participate. There were no other exclusion criteria set as no child should feel excluded from the study. Recruitment criteria and data treatment were planned in accordance to the principles of the Declaration of Helsinki. The study was approved by the Ethical Committee of the University of Florence, Italy.

2.2. Data collection

Testing took place in the regular classrooms of the schools by collecting data in one school class at a time. The testing lasted approximately one hour and was conducted in the morning. The children sat in their general seating order either in rows or in groups of 2-6 children.
During each testing session, one instructor and 3-4 assistants were present to ensure the protocol-based procedure and helped to distribute the tablets. The teacher was present during the session to ensure the children were less distracted and felt more at ease. Before each session, the instructor explained the questionnaire and made sure all children were confident how to use the tablets. Children were allowed to ask for assistance in case they had difficulties in how to use the tablets. Data were collected on tablets (Acer Iconia One 10, Android 7.0) using the software Compusense Cloud (Compusense, Inc., Guelph, Ontario, Canada).

2.3. Emoji

Emojis were obtained from Apple iOS 12.2 (Apple, inc, Cupertino, CA) accessed through Emojipedia on the 4th of April 2019 (Emojipedia, 2019). It was intended to only use facial images for the selection of food-related emojis and to use all facial emojis that were available at that time point. This approach was adopted due to the explorative nature of the study to let only pre-adolescents select food-related emojis that they considered appropriate, contrary to studies with pre-adolescents that conducted a pre-selection of emojis by adults (Gallo et al., 2017a, 2017b; Schouteten et al., 2019; Swaney-Stueve et al., 2018). In total, 92 facial emojis were considered for the study. One of the school classes acted as a pilot class to pre-test, if children had any difficulties with the length of the emoji list and if boredom effects occurred. Children did not express any problem with the emoji list and found the test easy to do. Emojis are depicted in Table 1 with their names retrieved from Emojipedia (Emojipedia, 2019). The names were not displayed to the children. The order of emojis was randomized for each child and for every food context.

2.4. Procedure

The test was individual. Subjects were asked to recall foods associated to seven eating contexts by using an open-ended response option (written response to an evoked context). The eating contexts included "Breakfast" (breakfast of the morning before coming to school), "Dinner" (yesterday's dinner), "Snack" (yesterday's snack consumed in the morning or in the afternoon),

"Birthday" (a typical food consumed during their last birthday party), a "Novel food" (the children were asked to recall a situation in which they were invited to taste a food they never tasted before; e.g. at a friend's or relative's place) and "most liked/most disliked foods". After describing foods related to the first evoked eating context children were presented with the 92 facial emojis and asked to check those that apply (Check-All-That-Apply format) to describe how they feel in response to the self-selected foods. The same two-step procedure was repeated for all the considered eating contexts.

As soon as a child finished the first part of emoji selection, they were asked to solve a riddle until the last child finished the emoji selection task. Then, children were asked about demographics (gender and age) and to fill in a questionnaire (Supplementary materials 1 - Table S1) about emoji usage and asked to evaluate the test. Several domains of emojis usage were considered: Familiarity; Frequency of usage; Social use; Motivation; Valence of emojis; Enjoyment in using emojis; Two more questions were asked to the children to know how difficult the test was (*very difficult/a bit difficult/neither difficult nor easy/ easy/very easy*) and how much they enjoyed it (*by no means/a bit/so and so/fairly/a lot*).

2.5. Data analysis

Data from the questionnaire on emoji usage were analyzed by computing frequencies (%) of children that responded to each question. Gender and age effects on familiarity, frequency of usage of emojis and enjoyment were tested by using Kruskal–Wallis One–Way Analysis of Variance by ranks. Chi-squared test was applied to test differences between genders and age groups in each item of the other domains.

For each eating context, the frequency of each emoji across subjects was determined. Emojis selected by >20% of participants in at least one eating context qualified as food-related emojis. Emojis ≤20% were not considered for further analysis as they did not qualify as food-related emojis, with some exception of emoji that were assumed to be potentially relevant but not sufficiently aroused by our stimuli (eating contexts).

Average emoji selection across eating contexts was calculated for genders and age groups separately. Age- and gender differences in the frequency of selection of each emoji were tested by using a Chi-square test for each eating context.

The level of significance for all the analysis was set at $p \leq 0.05$. Statistical analyses were performed using XLSTAT (Version XLSTAT 2018.7, Excel 14.0.6024, Windows 10, Build 54971, XLSTAT-Sensory).

For each evoked eating context, the frequency of recalled foods was analyzed using the text-analysis software T-LAB 2020.1 (Plus version 5.1.0.4; T-LAB di Lancia Franco, Italy). First, words not relevant for analysis (stop words such as "and", "the", "a" and "an") were removed. Secondly, foods that were very similar were grouped (e.g. Italian "focaccia" and "panino" were grouped into "sandwich"); when a food in a food category was frequently mentioned it was not grouped under the category label but, instead, it was considered as a separate food item (e.g. *broccoli, spinach* and other frequently mentioned vegetables in the context "Most disliked foods" were counted separately, while all other vegetables were grouped under the *vegetable* label). Frequency of foods (foods occurring only once were excluded) were visualized as a word

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

cloud using XLSTAT. Foods stated more frequently were displayed in bigger letters and foods stated less frequently were displayed in smaller letters.

3. Results

3.1. Emoji Usage Questionnaire (EUQ) and test evaluation questions

Most children found that the test was very easy (63%) or easy (22%) to do and enjoyed participating in it a lot (76%) or fairly (18%) regardless of gender and age. No significant gender differences were found for neither of the domains of the EUQ (see Supplementary materials 1 - Table S1). In contrast, a significant age effect was found for "familiarity with" and "frequency of use" of emojis and for specific items of the domains "social use" and "valence of emojis". Emojis were shown to be very familiar across subjects. Overall, children reported to use them regularly (68%) or occasionally (26%), but older children were more familiar with emojis than younger (p=0.006). In general subjects used emojis a few times a week (42%) or every day (24%), whereof 12-13-year-olds showed higher frequency of usage (p=0.007). Social use of emojis was shown to be mostly popular among friends (75%), with relatives (57%) and with parents (55%). Older children significantly differed from the younger ones for a higher frequency of the items "send emojis to friends" (p<0.0001), "to parents" (p=0.026) and "to teachers" (p=0.017).

Seventy % of subjects reported emojis being fun to use, which was the highest consensus among children compared to the other items within the domain "motivation". Lower percentages of children reported that emojis can be used to express something that normally cannot be described in words (45%), that they make text messages more understandable (45%) and that they can be used instead of words (42%). Age did not affect responses for any item of the motivation domain.

Children reported to use mostly positive emojis (72%) and enjoy using emojis a lot (65%) or fairly (25%).

3.2. Foods recalled by each evoked context

Children reported foods that were consumed in seven eating contexts in response to an open-ended question (e.g. Figure 1; see Supplementary materials 2 – Figure S1a-g for all eating contexts). The type of foods was found to be specific for each eating context. For the "Most liked food" the most occurring foods were *pizza* (40%) and *pasta* (28%); for the "Most disliked food" it was *broccoli* (17%) and *spinach* (16%); for "Breakfast" it was *milk* (55%) and *biscuits* (50%); for "Dinner" it was *pasta* (32%) and several other foods like *chicken*, *salad*, *vegetables* and *fish* (14-16%); for "Snack" it was *bread* (31%) and *Nutella*, *sandwich* and *ham* (13-15%); for "Birthday" it was *cake* (51%) followed by *pizza*, *chips* and *chocolate* (14-21%). For the context "Novel food" foods were more specific for each child resulting in a wider variety of foods e.g. *vegetables* (13%), *specific combinations of pasta with sauce* (11%), *other non-Italian recipes* (10%), *oriental recipes* (7%) and *fish* (6%).

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

Please insert Figure 1 around here.

3.3. Food-related emojis

In total, 44 emojis were associated with a frequency of at least 20% to foods recalled by each evoked eating contexts and thus were qualified as "food-related" (Table 1). *Neutral face* (😐) and *face with open mouth* (😮) were selected less than 20%, but still considered for further analysis because they were assumed to be potentially relevant for the association with the emotions of "surprise" and "indifference". They were also included in previous studies with 8-11 y.o. pre-adolescents (Schouteten et al., 2019). Consequently, the complete food-related emoji list comprised of 46 emojis.

During data analysis, significant age- and gender differences were detected, which are described more in detail in the following sections.

Please insert Table 1. around here.

3.4. Emojis associated to foods recalled by varied evoked eating contexts

It was shown that the number of emojis associated to recalled foods varied across eating contexts (Table 2). The highest number of emojis associated to foods recalled by the evoked context resulted for "Most liked food" (23 emojis), followed by "Birthday" (21 emojis), "Most disliked food" (19 emojis), "Snack" (10 emojis), "Novel food" (9 emojis), "Breakfast" (7 emojis) and "Dinner" (6 emojis).

Emojis associated to foods recalled by the contexts "Birthday", "Snack", "Novel food", "Breakfast" and "Dinner" were mostly positive. They were also associated to foods of the context "Most liked food". However, emojis selected to describe foods for "Birthday" included two specific ones that did not appear in "Most liked food" such as *smiling face with halo* (😇) and *squinting face with tongue* (😝). Frequencies of the most selected emojis in response to foods recalled by these "*positive*" eating contexts varied from 30 ("Novel food") to 58% ("Birthday").

As expected, subjects associated mostly negative emojis with their "most disliked food". Within this context, children also had the highest agreement for the use of the emoji *face vomiting* (🤮), with 85% of respondents that defined this emoji as appropriate to describe their experience of the foods recalled by this context.

Please insert Table 2. around here.

3.5. Gender differences in emoji selection

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

In general, females selected food-related emojis more frequently than males (Figure 2). Girls selected an average of 8.8 emojis across all evoked eating contexts in contrast to boys that selected on average 7.3 emojis. Significant gender differences were also found in emoji frequencies describing foods evoked by each eating context except for "Novel food". Especially, emojis with hearts were selected more often by girls in general and in some specific, eating contexts. Frequencies of the *smiling face with heart-eyes* (😍) were significantly higher (p<0.05) in females than in males for the foods recalled by the contexts "Most liked food, "Breakfast, and "Snack". The same significant (p<0.05) gender effect was found for the *face blowing a kiss* (😘) in relation to the evoked contexts "Most liked food" and "Birthday", and the *smiling face with hearts* (🥰) for the context "Most liked food" (p=0.010). For "Most liked food", girls selected significantly (p<0.05) more than boys also the emojis *zany face* (🤪), *hugging face* (🤗)and *smiling face* (☺️). For foods evoked by the context "Dinner", females selected *star-struck* (🤩) significantly (p=0.033) more often than males. Finally, girls associated the emojis *nauseated face* (🤢) (p=0.008) and *dizzy face* (😵) (p=0.012) more frequently to foods recalled by the context "Most disliked food" than boys.

3.6. Age differences in emoji selection

In general, 9-11-year-olds tended to use emojis more frequently than 12-13-year-olds (Figure 3). Younger subjects selected an average of 6.9 emojis across all contexts in contrast to older subjects with 4.4 emojis. Age differences were mainly related to the foods evoked by the eating contexts "Birthday" and "Novel food", where younger subjects selected laughing/smiling emojis (e.g. *grinning face with big eyes* (😃)) and emojis showing their tongue (e.g. *face with tongue* (😛)) significantly (p<0.05) more frequently than older subjects. The emoji *star-struck* (🤩) was stated more frequently among 9-11-year-old subjects in response to foods of the evoked contexts "Snack", "Birthday" and "Novel food" (p<0.05) and the *money-mouth face* (🤑) was stated more frequently in the evoked contexts "Birthday" and "Most liked food" (p<0.01). The *smiling face with halo* (😇) was stated more frequently by younger children for foods of the context "Birthday" (p=0.024). For foods evoked by the context "Most disliked food", the emojis *hot face* (🥵) and *dizzy face* (😵) were stated more frequently by younger subjects (p<0.05). Only one emoji, the *face savoring food* (😋), was stated more frequently by 12-13-year-old subjects for foods recalled by the context "Breakfast" (p=0.028).

Please insert Figure 2 around here.

Please insert Figure 3 around here.

4. Discussion

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

The present study explored the appropriateness of emojis to describe pre-adolescent's emotions elicited by foods recalled in relation to different evoked eating contexts and to explore related age- and gender differences. Forty-six emojis resulted as appropriate to describe emotions in different eating contexts. The number of selected emojis varied across evoked eating contexts eliciting different foods. As expected, age and gender significantly affected emoji selection across and within foods elicited by varied eating contexts.

4.2. Emoji Usage Questionnaire (EUQ) and test evaluation questions

Children found the test easy to do, enjoyed participating in it and enjoyed using emojis to a great extent. This is a very important information as it implies that children's involvement and attention in the test was high and they were motivated to participate in the test. The fact that the test was conducted on tablets engaged and motivated the children, turning the questionnaire into a gamification task (Simões, Redondo, & Vilas, 2013). Verbal emotion lists can result in boredom and fatigue (Jaeger, Cardello, & Schutz, 2013), whereas emojis might help to increase the attention span. Children were able to fill out the questionnaire independently, which is encouraged when conducting consumer tests with children (see Laureati & Pagliarini, 2018).

All children, but especially older children, were already familiar with emojis and used them frequently before the study, which was also observed previously among this age group (Gallo et al., 2017a). Consistent with previous findings (Commonsensemedia, 2016; Howard, 2018), it was found that 12-13 y.o. children have a more intense and structured social media usage of emojis than 9-11 y.o. children. In fact, it was shown that especially older children send emojis to friends, parents and teachers, which implies that they already have an increased social network and that they communicate more digitally with these people compared to younger children.

Overall these findings confirm the opportunity of testing the age effect among pre-adolescents due to a varied familiarity with and a frequency of emoji usage. However, relevant age differences in the valence domain of the EUQ did not emerge. Similarly, age did not affect responses for any item of the motivation domain. This means that children aged 9-13 use emojis for similar reasons, whereof the most important reason why emojis are used was that they "are fun to use".

Children reported to use mostly positive emojis, which could be one of the explanations why they used so many positive emojis when describing how they felt about their foods recalled by various eating contexts.

Future research may extend the focus to further dimensions investigated in adults, such as meaningfulness, visual complexity, and arousal (Rodrigues, Prada, Gaspar, Garrido, & Lopes, 2018).

4.3. Foods recalled by each evoked context

Pre-adolescents were able to recall foods for each evoked eating context. Each eating context resulted in a unique collection of foods, of which some foods were stated very frequently and specific for each context. For example, in the context "Most liked food" *pizza* and *pasta*, but also several meat products were among the most frequently stated foods, which aligns with

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

Beyer & Morris (1974). Various vegetables (especially *spinach* and *broccoli*) and vegetables in general were stated as the most disliked foods, which is in accordance with previous research showing that vegetables were among children's most disliked foods (De Moura, 2007). The foods of the eating contexts "Breakfast", "Dinner" and "Lunch" represented foods that were commonly consumed for these occasions (Monteleone & Dinnella, 2009). "Novel foods" resulted in a wide variety of foods and showed only minor overlappings between children. This could be explained by the fact that each child has a different idea of what food is most novel to them, hence, resulting in very individual food choices.

4.4. Food-related emojis

Only facial images were used for the selection of food-related emojis. A similar approach was adopted by Gallo et al. (2017a), but in contrast, we did not exclude any facial emojis previously given the explorative nature of the study. Children did not show any difficulties in recalling their previously consumed foods and expressing how they felt about them.

In total, 46 emojis qualified as food-related after children's selection. This number is slightly higher than the number of emojis included in emoji lists used in previous studies on children (Gallo et al. 2017; Schouteten et al., 2019, 2018). More interestingly, similarities and differences with previously used lists were found. There were some similarities in specific emojis used to describe emotions elicited by foods in children (Gallo et al., 2017a; Schouteten et al., 2019), but also in adults (Jaeger, Vidal, et al., 2017). Although, the studies cannot directly be compared due to differences in methodological approaches on how food-related emojis were selected (e.g. focus groups or emoji lists based on adults), some emojis seem to be very popular to describe emotions towards foods. For example, Gallo et al. (2017a) found 38 emojis to be appropriate to describe foods, of which 25 overlap with our findings. Differently from this study the following emojis were found to be food-related in our study with a selection of <20%: *face without mouth* (😶), *anguished face* (😧), *kissing face with closed eyes* (😚), *frowning face with open mouth* (😦), *flushed face* (😳), *pensive face* (😔), *unamused face* (😒), *worried face* (😟), *confused face* (😕), *expressionless face* (😑), *disappointed face* (😞), *sleeping face* (😴) and *grimacing face* (😬).

Schouteten et al. (2019) showed (using the standardized emoji list of Gallo et al. (2017a) the *face savoring food* (😋), *winking face with tongue* (😜), *grinning face* (😀) and *smiling face with sunglasses* (😎) were among the most frequently selected emojis to describe food samples with a mean usage frequency >20%, which was also confirmed in our study (see Table 2). The *face with tears of joy* (😂) and *smirking face* (😏) were not demonstrated to be useful to describe the experience of food products, which is in line with Schouteten et al. (2018). On the other hand, *weary face* (😩) included in the product-specific list was found to be discriminative among speculoos biscuits by Schouteten et al. (2019), but was selected by less than the 20% of children as food-appropriate in our study. All emojis of the product-specific list (Schouteten et al., 2019) with exception of the *weary face* (😩) and the non-facial emojis were also part in our food-related emoji list.

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

These congruencies indirectly indicate that the proposed approach allowed us to select relevant emojis assumed to describe emotions elicited by foods in pre-adolescents. In addition, all available emojis at the time of data collection increased the list of existing food-related emojis through newly developed or updated emojis. Our findings showed that some of these novel images were used quite frequently when children described how they felt about their foods recalled by various eating contexts. One of the most popular emojis was *star-struck* (🤩), which was the most frequently stated emoji in 5 out of 7 eating contexts. Other examples of new food-related emojis relevant to describe emotions elicited by foods included *exploding face* (🤯), *partying face* (🥳), *money-mouth face* (🤑), *smiling face with halo* (😇), *drooling face* (🤤), *nauseated face* (🤢), *face vomiting* (🤮), *angry face with horns* (😈) and *face with symbols on mouth* (🤬). Consequently, these novel emojis could have the potential to be used in an emotion measurement tool to discriminate between real food products.

3.2. Emojis associated to foods recalled by varied evoked eating contexts

Regarding context-specific differences it was demonstrated that the numbers of food-related emojis differed between eating contexts. Foods recalled by the contexts "Most liked food", "Birthday" and "Most disliked food" elicited the highest frequencies of emojis (respectively 23, 21 and 19 emojis). This result was somehow expected and could be explained by the fact that the foods eaten in these contexts evoked more emotions in pre-adolescents. The foods eaten in the "Breakfast", "Lunch" and "Dinner" contexts might resemble more general consumed foods that only elicit a limited number and variety of emotions. In addition, the eating context of "Birthday" activates more positive emotions than everyday meals. Interestingly, the foods recalled by the eating context "Novel food" elicited mostly positive emojis. This was not expected as novel foods are often rejected by pre-adolescents and usually lead to more negative attitudes towards them (Damsbo-Svendsen, Frøst, & Olsen, 2017). An explanation could be that pre-adolescents recalled primarily novel foods that they actually liked, thus, they associated these foods with a positive context. Novelty has been proposed as a dimension, which structures emotion meaning in addition to valence, arousal and control, and which is explicated by surprise (Fontaine & Veirman, 2013). Additionally, pre-adolescents that like to taste novel foods could be triggered by their curiosity to taste them (Sick, Højer, & Olsen, 2019). Also, curiosity has been previously described as a positive emotion (Kashdan & Silvia, 2009), which might have triggered more positive emotions in general.

The two contexts of "Most liked food" and "Most disliked food" elicited the majority of all food-related emojis and contributed to a rather balanced distribution of positive and negative emojis. An equal balance of positively and negatively associated emojis (38 emoji in total) was also obtained in other research (Gallo et al., 2017a). However, we could not identify any "neutral" emojis in our study in contrast to Gallo et al. (2017a), who found that the *relieved face* (😌) was regarded as neutral; in our study this emojis was frequently elicited by foods recalled by the context "Most liked food".

3.3. Gender differences in emoji selection

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

In this study, girls tended to select more emojis than boys. Similar findings were observed previously, where girls mentioned emojis in their discussion about food-provoked emotions more often than boys (Gallo et al., 2017a) and females used emojis in their text messages more frequently (Chen et al., 2018). An explanation for this could be that females use more non-verbal communication than males (Hall & Gunnery, 2013) and that females were found to have a higher emotional expressivity (Diener, Sandvik, & Larsen, 1985; Kring & Gordon, 1998), even if the findings about gender differences in the food emotion research are controversial (Cardello & Jaeger, 2016).

Although gender differences were minor, it was demonstrated that girls and boys mostly differed in their selection of emojis with hearts. For girls, emojis with hearts seemed to be more relevant to describe positive emotions elicited by foods of recalled contexts. Girls might be able to perceive or express more "lovable" and "endearing" emotions when describing their feelings towards foods, which could be explained by findings showing that women were more probable to communicate love in real life (Wilkins & Gareis, 2006). Boys might exhibit restrictive emotionality for some particular emotions (Jansz, 2000) or they think that emojis with hearts are something for females. These findings may be explained by the role of culture in shaping gender identity and confirm how much gender stereotypes are rooted since childhood (Martinez, Osornio, Halim, & Zosuls, 2019).

For other food-related emojis (e.g. *nauseated face* 🤢 and *dizzy face* 😵) it was less clear why they were selected more frequently by girls. Literature on gender differences in emoji selection is very scarce, hence, future research should investigate differences between genders.

3.4. Age differences in emoji selection

On average, 9-11-year-olds selected a higher number of emojis and used them more frequently to describe their feelings towards foods recalled in various contexts compared to older children. An opposite trend would have been expected since older children are more familiar with and more frequent users of emojis as shown in the EUQ. Especially, for foods recalled by the contexts "Birthday" and "Novel food", younger children significantly selected specific emojis more often than older children. A previously conducted study by Pagliarini, Gabbiadini, & Ratti (2005) found age-related differences in respect to liking scores, where younger children generally gave higher liking ratings compared to older children. The results were explained by the assumption that older children already have an increased self-confidence in their preferences, and thus making more critical and selective choices with growing age. In the current study it might be speculated that older children are also more selective towards emotional responses, which might explain the results.

In respect to some specific emojis, younger children preferred laughing/smiling emojis and emojis showing their tongue to describe their emotions towards foods that were recalled in several eating contexts. A study showed that younger children tended to use more positive emotions to describe their food-related emotions (Gallo et al., 2017a). Younger children were also shown to differ in their emotion expression (Chaplin & Aldao, 2013), which could lead to differences in how children feel about foods recalled by various contexts. Our findings suggest

that attention should be paid to the children's age and gender when using emoji-based approaches, but more research is needed to better understand differences related to gender and age. In fact, the number of children in each age or gender group in our study was relatively small (between 41-55 children per group), thus studies with bigger sample sizes would be beneficial to generalize these findings.

4. Conclusions

An approach based on recalled food evoked by varied eating context was applied to select emojis used by pre-adolescents to represent how they feel in response to food. The CATA method using emojis was shown easy to apply and allowed to define a large list of food-related emojis including facial emojis that were never used in previous studies in this respect. However, as the current list of food-related emojis might contain emojis with very similar meanings, a deep investigation of their meaning is recommended. Significant age- and gender differences were found in the selection of food-related emojis and therefore, future research should investigate if there are differences in the interpretation of food-related emojis.

Author contributions

Julia Sick: Writing – original draft preparation, Conceptualization; Investigation, Formal analysis, Visualization, Methodology. Sara Spinelli: Writing – review and editing; Investigation; Conceptualization; Methodology. Caterina Dinnella: Writing – review and editing. Erminio Monteleone: Writing – review and editing, Conceptualization; Supervision; Project administration; Funding acquisition.

Acknowledgments

The study was conducted as part of the project "Edulia - Bringing down barriers to children's healthy eating", which has received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No 764985.

Declarations of conflicts

The authors declare that there is no conflict of interest regarding publication of this paper.

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

References

Barbieri, F., Kruszewski, G., Ronzano, F., & Saggion, H. (2016). How cosmopolitan are Emojis? Exploring Emojis usage and meaning over different languages with distributional semantics. In *MM 2016 - Proceedings of the 2016 ACM Multimedia Conference* (pp. 531–535). Association for Computing Machinery, Inc. https://doi.org/10.1145/2964284.2967278

Beyer, N. R., & Morris, P. M. (1974). Food attitudes and snacking patterns of young children. *Journal of Nutrition Education*, *6*(4), 131–133. https://doi.org/10.1016/S0022-3182(74)80006-3

Cardello, A. V., & Jaeger, S. R. (2016). Measurement of Consumer Product Emotions Using Questionnaires. In *Emotion Measurement* (pp. 165–200). Elsevier Inc. https://doi.org/10.1016/B978-0-08-100508-8.00008-4

Chaplin, T. M., & Aldao, A. (2013). Gender differences in emotion expression in children: a meta-analytic review. *Psychological Bulletin*, *139*(4), 735–765. https://doi.org/10.1037/a0030737

Chen, Z., Lu, X., Ai, W., Li, H., Mei, Q., & Liu, X. (2018). Through a Gender Lens: Learning Usage Patterns of Emojis from Large-Scale Android Users (pp. 763–772). https://doi.org/10.1145/3178876.3186157

Commonsensemedia. (2016). The Common Sense Census: Plugged-In Parents of Tweens and Teens 2016 | Common Sense Media. Retrieved October 16, 2019, from https://www.commonsensemedia.org/research/the-common-sense-census-plugged-in-parents-of-tweens-and-teens-2016

Damsbo-Svendsen, M., Frøst, M. B., & Olsen, A. (2017). Development of novel tools to measure food neophobia in children. *Appetite*, *113*, 255–263. https://doi.org/10.1016/j.appet.2017.02.035

De Moura, S. L. (2007). Determinants of food rejection amongst school children. *Appetite*, *49*(3), 716–719. https://doi.org/10.1016/j.appet.2007.08.006

De Pelsmaeker, S., Schouteten, J., & Gellynck, X. (2013). The consumption of flavored milk among a children population. The influence of beliefs and the association of brands with emotions. *Appetite*, *71*, 279–286. https://doi.org/10.1016/j.appet.2013.08.016

Diener, E., Sandvik, E., & Larsen, R. J. (1985). Age and Sex Effects for Emotional Intensity. *Developmental Psychology*, *21*(3), 542–546. https://doi.org/10.1037/0012-1649.21.3.542

Eccles, J. S. (1999). The development of children ages 6 to 14. In *The Future of children* (Vol. 9, pp. 30–44). Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10646256

Emojipedia. (2019). Apple Emoji List. Retrieved April 4, 2019, from https://emojipedia.org/apple/

Fischer, A. H., Rodriguez Mosquera, P. M., Van Vianen, A. E. M., & Manstead, A. S. R. (2004). Gender and Culture Differences in Emotion. *Emotion*, *4*(1), 87–94. https://doi.org/10.1037/1528-3542.4.1.87

Fontaine, J. R. J., & Veirman, E. (2013). The new novelty dimension: Method artifact or basic dimension in the cognitive structure of the emotion domain? In *Components of Emotional Meaning* (pp. 233–242). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199592746.003.0015

Gallo, K. E., Swaney-Stueve, M., & Chambers, D. H. (2017a). A focus group approach to understanding food-related emotions with children using words and emojis. *Journal of Sensory Studies*, *32*(3), e12264. https://doi.org/10.1111/joss.12264

Gallo, K. E., Swaney-Stueve, M., & Chambers, D. H. (2017b). Comparing visual food images versus actual food when measuring emotional response of children. *Journal of Sensory*

Studies, *32*(3), e12267. https://doi.org/10.1111/joss.12267

Hall, J. A., & Gunnery, S. D. (2013). Gender differences in nonverbal communication. In J. A. Hall & M. L. Knapp (Eds.), *Handbooks of communication science. Nonverbal Communication* (pp. 639–669). DE GRUYTER. https://doi.org/10.1515/9783110238150.639

Howard, J. (2018). Social media and kids: What age do they start? - CNN. Retrieved October 16, 2019, from https://edition.cnn.com/2018/06/22/health/social-media-for-kids-parent-curve/index.html

Jaeger, S. R., Cardello, A. V., & Schutz, H. G. (2013). Emotion questionnaires: A consumer-centric perspective. *Food Quality and Preference*, *30*(2), 229–241. https://doi.org/10.1016/j.foodqual.2013.05.015

Jaeger, S. R., Lee, S. M., Kim, K. O., Chheang, S. L., Jin, D., & Ares, G. (2017). Measurement of product emotions using emoji surveys: Case studies with tasted foods and beverages. *Food Quality and Preference*, *62*, 46–59. https://doi.org/10.1016/j.foodqual.2017.05.016

Jaeger, S. R., Lee, S. M., Kim, K. O., Chheang, S. L., Roigard, C. M., & Ares, G. (2018). CATA and RATA questions for product-focused emotion research: Five case studies using emoji questionnaires. *Food Quality and Preference*, *68*, 342–348. https://doi.org/10.1016/j.foodqual.2018.04.001

Jaeger, S. R., Roigard, C. M., & Ares, G. (2018). Measuring consumers' product associations with emoji and emotion word questionnaires: case studies with tasted foods and written stimuli. *Food Research International*, *111*, 732–747. https://doi.org/10.1016/J.FOODRES.2018.04.010

Jaeger, S. R., Vidal, L., Kam, K., & Ares, G. (2017). Can emoji be used as a direct method to measure emotional associations to food names? Preliminary investigations with consumers in USA and China. *Food Quality and Preference*, *56*, 38–48. https://doi.org/10.1016/j.foodqual.2016.09.005

Jaeger, S. R., Xia, Y., Lee, P. Y., Hunter, D. C., Beresford, M. K., & Ares, G. (2018). Emoji questionnaires can be used with a range of population segments: Findings relating to age, gender and frequency of emoji/emoticon use. *Food Quality and Preference*, *68*, 397–410. https://doi.org/10.1016/j.foodqual.2017.12.011

Jansz, J. (2000). Masculine identity and restrictive emotionality. In A. H. Fischer (Ed.), *Gender and emotion* (pp. 166–186). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511628191.009

Jervis, M. G., Jervis, S. M., Guthrie, B., & Drake, M. A. (2014). Determining Children's Perceptions, Opinions and Attitudes for Sliced Sandwich Breads. *Journal of Sensory Studies*, *29*(5), 351–361. https://doi.org/10.1111/joss.12116

Jiang, Y., King, J. M., & Prinyawiwatkul, W. (2014, March 1). A review of measurement and relationships between food, eating behavior and emotion. *Trends in Food Science and Technology*. Elsevier. https://doi.org/10.1016/j.tifs.2013.12.005

Kashdan, T. B., & Silvia, P. J. (2009). Curiosity and Interest: The Benefits of Thriving on Novelty and Challenge. In S. J. Lopez & C. R. Snyder (Eds.), *The Oxford Handbook of Positive Psychology, (2 Ed.)* (pp. 366–374). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780195187243.013.0034

Kaye, L. K., Malone, S. A., & Wall, H. J. (2017, February 1). Emojis: Insights, Affordances, and Possibilities for Psychological Science. *Trends in Cognitive Sciences*. Elsevier Current Trends. https://doi.org/10.1016/j.tics.2016.10.007

Köster, E. P., & Mojet, J. (2015). From mood to food and from food to mood: A

psychological perspective on the measurement of food-related emotions in consumer research. *Food Research International*, *76*(P2), 180–191. https://doi.org/10.1016/J.FOODRES.2015.04.006

Kring, A. M., & Gordon, A. H. (1998). Sex Differences in Emotion: Expression, Experience, and Physiology. *Journal of Personality and Social Psychology*, *74*(3), 686–703. https://doi.org/10.1037/0022-3514.74.3.686

Larsen, J. T., To, Y. M., & Fireman, G. (2007). Children's understanding and experience of mixed emotions. *Psychological Science*, *18*(2), 186–191. https://doi.org/10.1111/j.1467-9280.2007.01870.x

Laureati, M., & Pagliarini, E. (2018). New developments in sensory and consumer research with children. In *Methods in Consumer Research, Volume 2: Alternative Approaches and Special Applications* (pp. 321–353). Woodhead Publishing. https://doi.org/10.1016/B978-0-08-101743-2.00013-3

Lu, X., Ai, W., Liu, X., Li, Q., Wang, N., Huang, G., & Mei, Q. (2016). Learning from the ubiquitous language: An empirical analysis of emoji usage of smartphone users. In *UbiComp 2016 - Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (pp. 770–780). New York, New York, USA: ACM Press. https://doi.org/10.1145/2971648.2971724

Macht, M. (2008). How emotions affect eating: A five-way model. *Appetite*, *50*(1), 1–11. https://doi.org/10.1016/J.APPET.2007.07.002

Martinez, M. A., Osornio, A., Halim, M. L. D., & Zosuls, K. M. (2019). Gender: Awareness, Identity, and Stereotyping. In *Reference Module in Neuroscience and Biobehavioral Psychology*. Elsevier. https://doi.org/10.1016/b978-0-12-809324-5.21818-x

Meiselman, H. L. (2016). *Emotion measurement*. *Emotion Measurement*. https://doi.org/10.1016/C2014-0-03427-2

Monteleone, E., & Dinnella, C. (2009). Italian meals. In H. L. Meiselman (Ed.), *Meals in Science and Practice: Interdisciplinary Research and Business Applications* (pp. 359–376). Woodhead Publishing. https://doi.org/10.1533/9781845695712.6.359

Pagliarini, E., Gabbiadini, N., & Ratti, S. (2005). Consumer testing with children on food combinations for school lunch. *Food Quality and Preference*, *16*(2), 131–138. https://doi.org/10.1016/j.foodqual.2004.03.001

Rodrigues, D., Prada, M., Gaspar, R., Garrido, M. V., & Lopes, D. (2018). Lisbon Emoji and Emoticon Database (LEED): Norms for emoji and emoticons in seven evaluative dimensions. *Behavior Research Methods*, *50*(1), 392–405. https://doi.org/10.3758/s13428-017-0878-6

Schouteten, J. J., Verwaeren, J., Gellynck, X., & Almli, V. L. (2019). Comparing a standardized to a product-specific emoji list for evaluating food products by children. *Food Quality and Preference*, *72*, 86–97. https://doi.org/10.1016/j.foodqual.2018.09.007

Schouteten, J. J., Verwaeren, J., Lagast, S., Gellynck, X., & De Steur, H. (2018). Emoji as a tool for measuring children's emotions when tasting food. *Food Quality and Preference*, *68*, 322–331. https://doi.org/10.1016/j.foodqual.2018.03.005

Sick, J., Højer, R., & Olsen, A. (2019). Children's self-reported reasons for accepting and rejecting foods. *Nutrients*, *11*(10), 2455. https://doi.org/10.3390/nu11102455

Simões, J., Redondo, R. D., & Vilas, A. F. (2013). A social gamification framework for a K-6 learning platform. *Computers in Human Behavior*, *29*(2), 345–353. https://doi.org/10.1016/j.chb.2012.06.007

Spinelli, S., & Monteleone, E. (2018). Emotional Responses to Products. In *Methods in Consumer Research, Volume 1: New Approaches to Classic Methods* (pp. 261–296).

Woodhead Publishing. https://doi.org/10.1016/B978-0-08-102089-0.00011-X

Swaney-Stueve, M., Jepsen, T., & Deubler, G. (2018). The emoji scale: A facial scale for the 21st century. *Food Quality and Preference*, *68*, 183–190. https://doi.org/10.1016/j.foodqual.2018.03.002

Wikipedia. (2019). Emoji. Retrieved September 19, 2019, from https://en.wikipedia.org/wiki/Emoji

Wilkins, R., & Gareis, E. (2006). Emotion expression and the locution "I love you": A cross-cultural study. *International Journal of Intercultural Relations*, *30*(1), 51–75. https://doi.org/10.1016/J.IJINTREL.2005.07.003

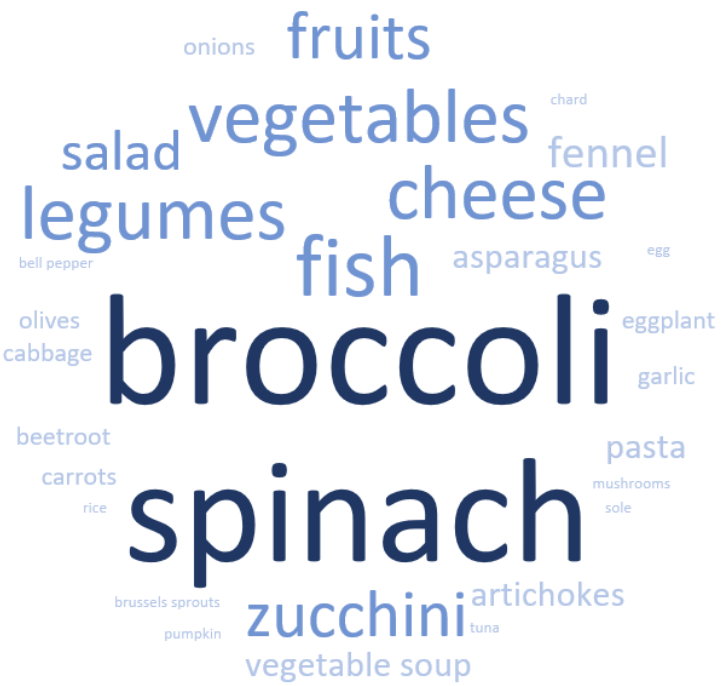
Zeman, J., Klimes-Dougan, B., Cassano, M., & Adrian, M. (2007, December 1). Measurement issues in emotion research with children and adolescents. *Clinical Psychology: Science and Practice*. John Wiley & Sons, Ltd (10.1111). https://doi.org/10.1111/j.1468-2850.2007.00098.x

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

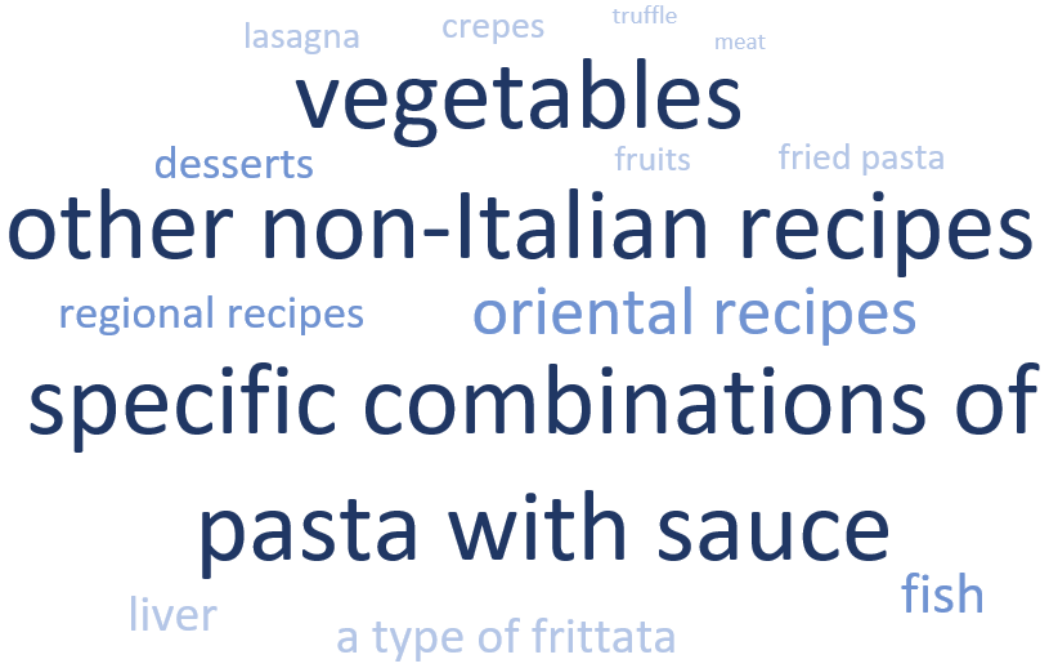
Tables and Figures

Figure 1. Self-reported foods recalled by the evoked contexts a) Most disliked and b) Novel food.

a) Most disliked food



b) Novel food



Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

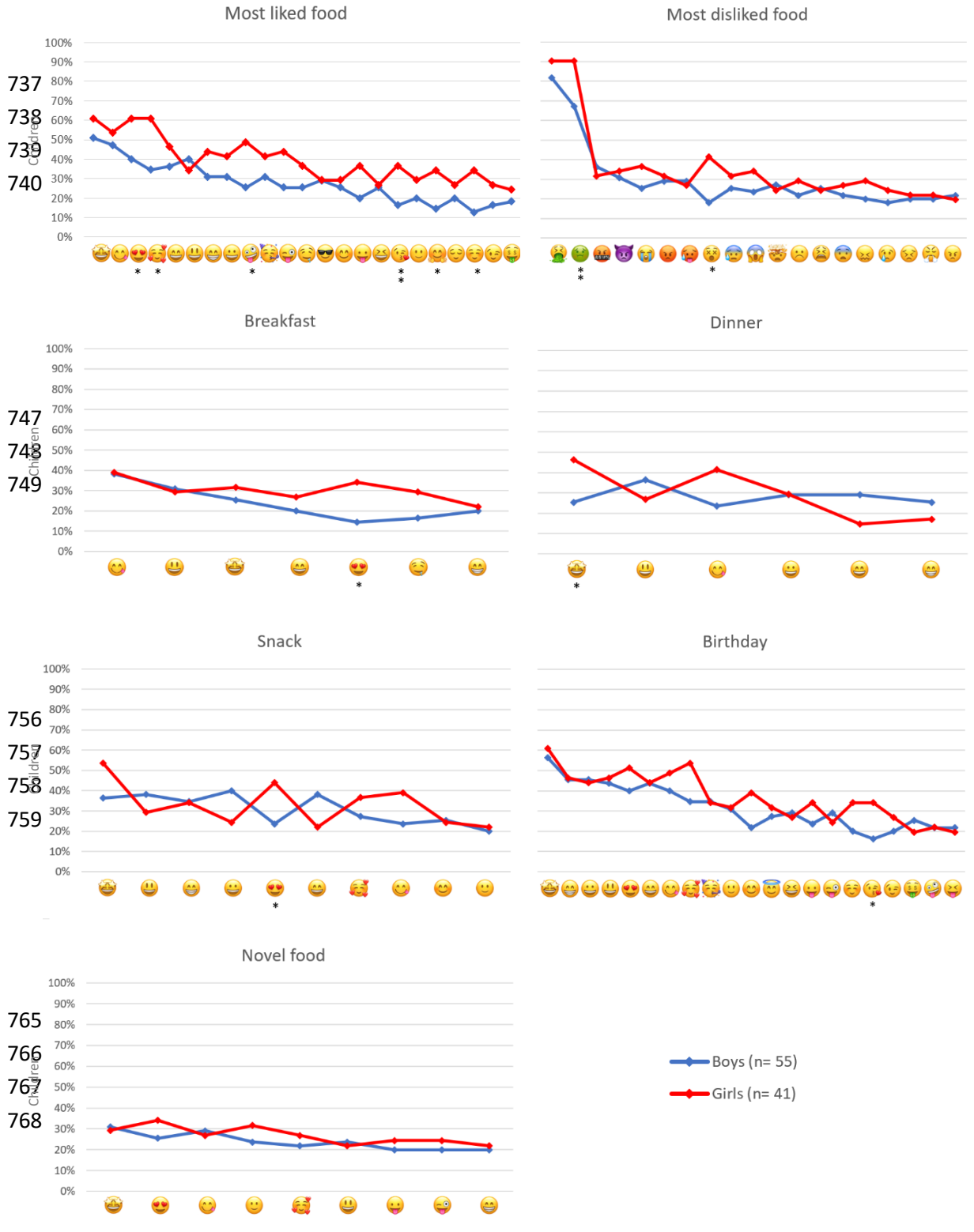


Figure 2. Food-related emojis shown for each context with significant differences between genders; most selected emojis in each context are shown from left to right; *=p≤0.05, **=p≤0.01, ***=p≤0.001.

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

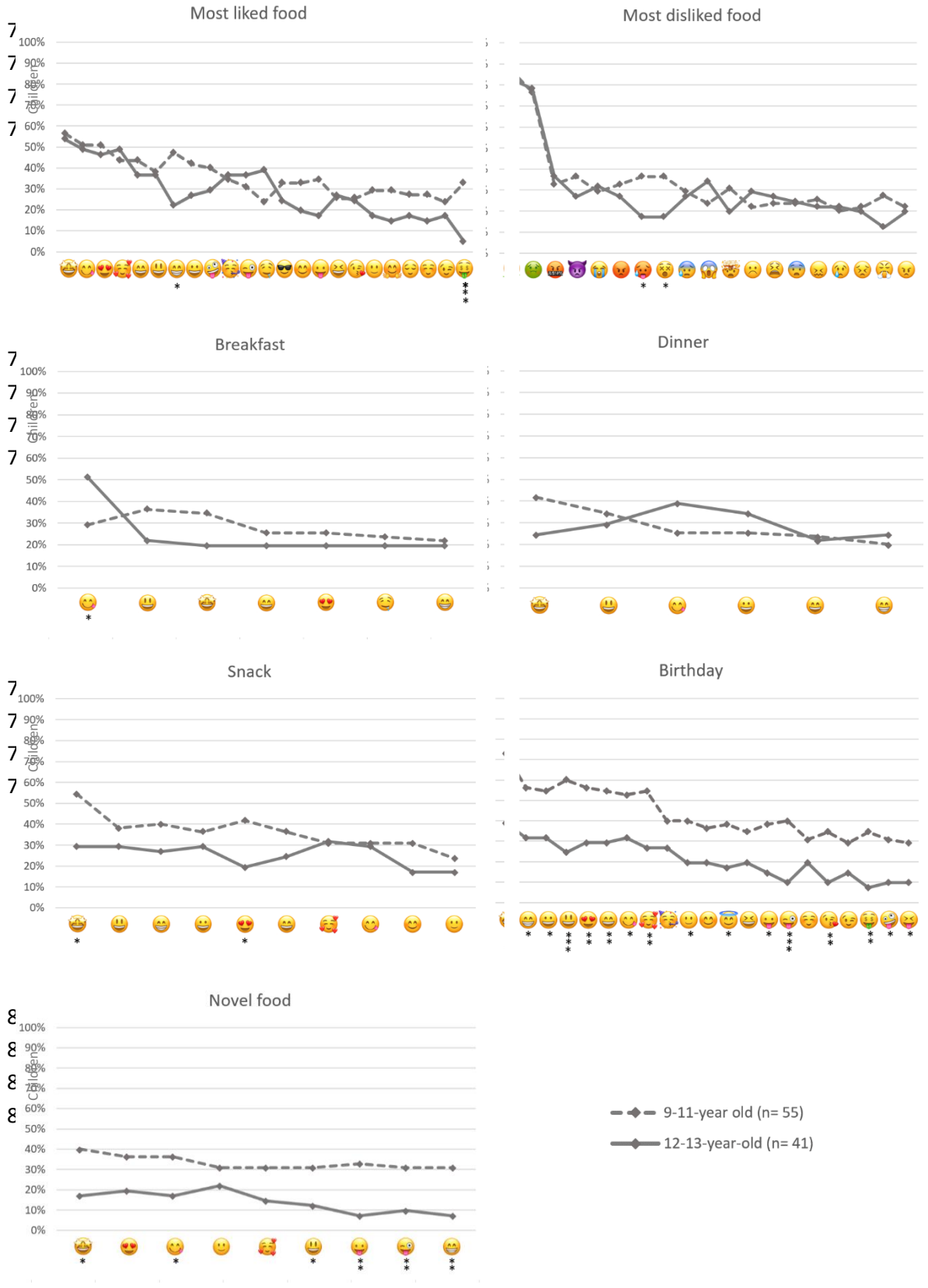


Figure 3. Food-related emojis shown for each context divided by age; most selected emojis in each context are shown from left to right; *=p≤0.05, **=p≤0.01, ***=p≤0.001.

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

Table 1. Full 92-item emoji list included in the CATA questionnaire with frequencies (%) of children (n=96) that selected emojis to describe the foods recalled by each eating context; ● = selected food-related emojis * = emojis selected by ≤20% of children, but still included as food-related emojis for further analysis.

	Emojis		Breakfast	Dinner	Snack	Most liked food	Most disliked food	Birthday	Novel food
●	😀	*grinning face*	18	29	33	35	0	45	20
●	😃	*grinning face with big eyes*	30	32	34	38	0	45	23
●	😄	*grinning face with smiling eyes*	23	23	31	41	0	44	18
●	😁	*beaming face with smiling eyes*	21	22	34	36	0	46	21
●	😆	*grinning squinting face*	8	7	14	26	0	28	16
	😅	*grinning face with sweat*	3	6	11	8	0	20	13
	🤣	*rolling on the floor laughing*	4	6	11	10	0	20	9
	😂	*face with tears of joy*	6	7	13	14	1	20	9
●	🙂	*slightly smiling face*	19	17	21	24	0	31	27
	🙃	*upside-down face*	7	7	11	10	1	20	8
●	😉	*winking face*	13	8	14	21	0	23	16
●	😊	*smiling face with smiling eyes*	16	9	25	27	0	29	16
●	😇	*smiling face with halo*	8	11	13	20	1	29	16
●	🥰	*smiling face with hearts*	23	19	31	46	1	43	24
●	😍	*smiling face with heart-eyes*	18	20	32	49	1	45	29
●	🤩	*star-struck*	28	34	44	55	1	58	30
●	😘	*face blowing a kiss*	9	3	14	25	0	24	20
	😗	*kissing face*	3	3	6	8	0	14	9
●	☺️	*smiling face*	15	9	15	22	0	26	17
	😚	*kissing face with closed eyes*	5	4	7	14	0	18	13
	😙	*kissing face with smiling eyes*	7	5	4	13	0	15	10
●	😋	*face savoring food*	39	31	30	50	0	44	28
●	😛	*face with tongue*	13	10	11	27	0	28	22
●	😜	*winking face with tongue*	13	6	13	33	0	27	22
●	🤪	*zany face*	11	6	13	35	0	22	16
●	😝	*squinting face with tongue*	6	7	7	19	1	21	19
●	🤑	*money-mouth face*	7	8	14	21	1	23	13
●	🤗	*hugging face*	17	8	15	23	0	19	16
	🤭	*face with hand over mouth*	5	1	2	1	11	1	5
	🤫	*shushing face*	1	3	3	4	1	3	4
	🤔	*thinking face*	5	9	3	1	2	0	9
	🤐	*zipper-mouth face*	2	3	3	2	13	1	2

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

		*face with raised eyebrow*	1	4	2	1	7	0	5
*		*neutral face*	5	6	3	0	14	1	8
		*expressionless face*	4	7	4	1	10	2	2
		*face without mouth*	4	6	2	1	8	2	5
		*smirking face*	7	6	6	10	1	4	5
		*unamused face*	1	4	1	0	14	1	2
		*face with rolling eyes*	1	5	1	0	7	1	4
		*grimacing face*	1	3	1	0	9	0	1
		*lying face*	2	3	0	0	2	0	1
●		*relieved face*	10	6	8	23	1	11	9
		*pensive face*	2	2	1	0	9	0	1
		*sleepy face*	2	3	0	0	9	0	0
●		*drooling face*	22	17	20	30	1	19	8
		*sleeping face*	8	5	3	1	1	0	0
		*face with medical mask*	1	1	0	0	20	0	3
		*face with thermometer*	1	1	0	1	13	0	2
		*face with head-bandage*	1	2	0	0	14	0	1
●		*nauseated face*	3	4	4	0	77	1	17
●		*face vomiting*	3	6	3	1	85	1	15
		*sneezing face*	1	1	0	0	11	0	4
●		*hot face*	2	3	2	0	28	1	10
		*cold face*	5	5	4	2	13	1	9
		*woozy face*	5	3	3	9	6	4	2
●		*dizzy face*	1	3	2	1	28	1	1
●		*exploding face*	6	4	3	8	26	4	6
		*cowboy hat face*	8	1	5	13	2	17	9
●		*partying face*	16	9	16	35	2	34	11
●		*smiling face with sunglasses*	13	7	14	29	1	17	10
		*nerd face*	2	3	5	5	0	3	1
		*face with monocle*	1	5	0	2	2	1	1
		*confused face*	1	3	0	0	16	2	2
		*worried face*	1	1	0	1	18	1	1
		*slightly frowning face*	2	4	2	0	20	0	2
●		*frowning face*	1	4	1	0	25	0	1
*		*face with open mouth*	6	3	4	4	7	1	3
		*hushed face*	3	1	2	1	6	2	3
		*astonished face*	2	5	3	7	6	0	2
		*flushed face*	2	1	0	1	8	2	2
		*pleading face*	4	4	6	6	17	5	5

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

		*frowning face with open mouth*	1	1	0	1	11	0	1
		*anguished face*	1	2	1	1	10	1	0
●		*fearful face*	1	2	1	2	24	0	5
●		*anxious face with sweat*	1	2	1	0	28	0	6
		*sad but relieved face*	1	1	0	0	17	1	4
●		*crying face*	1	1	1	1	21	0	0
●		*loudly crying face*	2	4	2	2	30	0	3
●		*face screaming fear*	2	3	1	1	28	0	7
●		*confounded face*	1	2	0	0	24	0	3
●		*perserving face*	1	1	1	0	21	0	3
		*disappointed face*	1	6	1	0	19	0	1
		*downcast face with sweat*	1	1	0	0	15	0	1
		*weary face*	1	4	0	1	15	1	1
●		*tired face*	1	1	0	1	25	2	2
		*yawning face*	9	3	2	1	11	0	1
●		*face with steam from nose*	2	4	2	0	21	1	1
●		*pouting face*	3	4	3	1	30	1	3
●		*angry face*	1	3	2	0	21	1	0
●		*face with symbols on mouth*	1	3	1	0	34	1	4
		*smiling face with horns*	5	6	3	5	16	5	3
●		*angry face with horns*	3	2	2	1	32	1	5

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953. https://doi.org/10.1016/j.foodqual.2020.103953

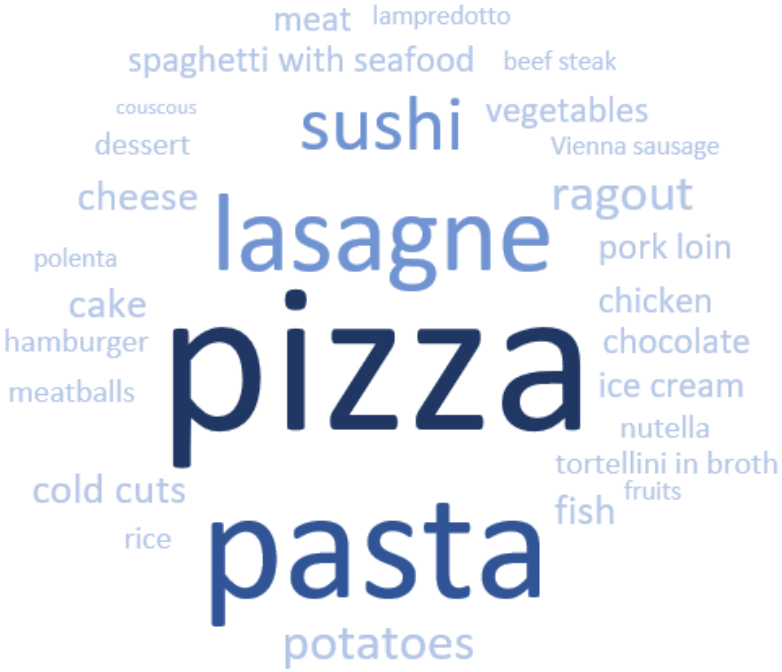
Table 2. Food-related emojis divided by evoked eating context. The highest number of selected emojis across contexts are shown from top to bottom and most frequently selected emojis within each context are shown from left to right.

Most liked food																										
%	55	50	49	46	41	38	36	35	35	35	33	30	29	27	27	26	25	24	23	23	22	21	21	
Birthday																									
%	58	46	45	45	45	44	44	43	34	31	29	29	28	28	27	26	24	23	23	22	21			
Most disliked food																									
%	85	77	34	32	30	30	28	28	28	28	26	25	25	24	24	21	21	21	21					
Snack																								
%	44	34	34	33	32	31	31	30	25	21														
Novel food																							
%	30	29	28	27	24	23	22	22	21															
Breakfast																								
%	39	30	28	23	23	22	21																	
Dinner																								
%	34	32	31	29	23	22																		

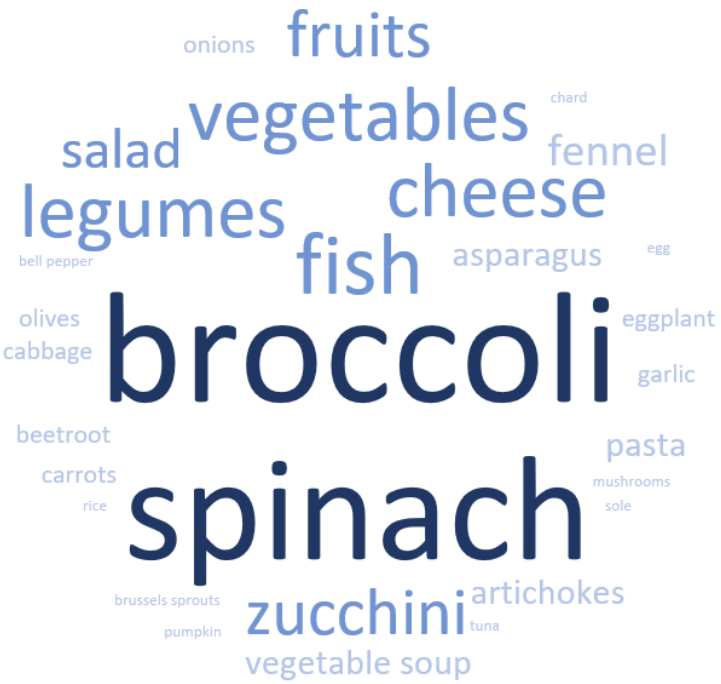
Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

Figure S1. Self-reported foods recalled by each evoked context; a) Most liked food b) Most disliked food c) Breakfast d) Dinner e) Snack f) Birthday g) Novel food.

a) Most liked food

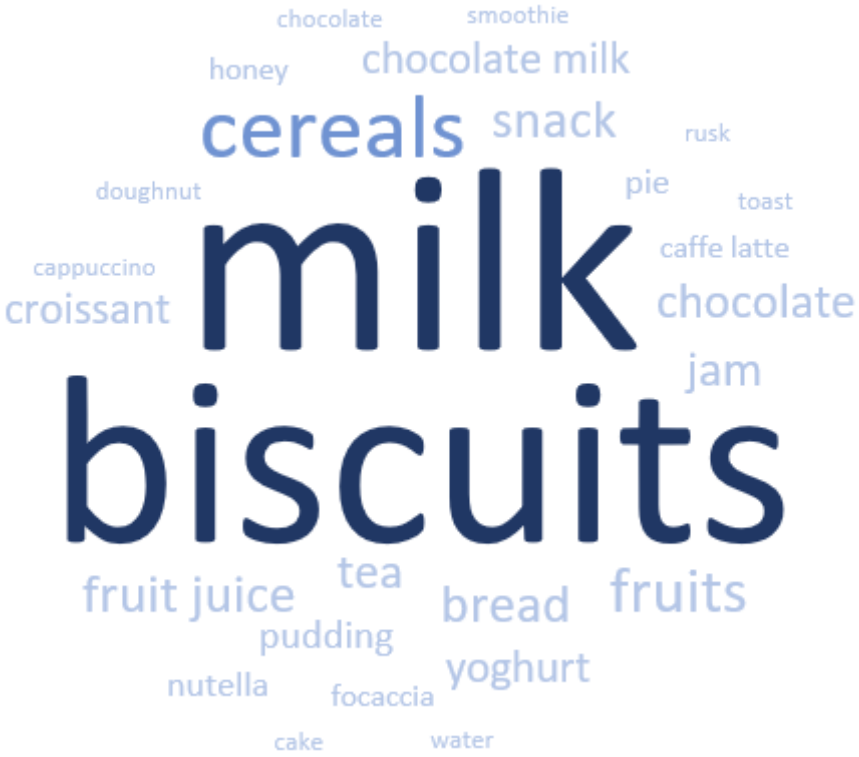


b) Most disliked food

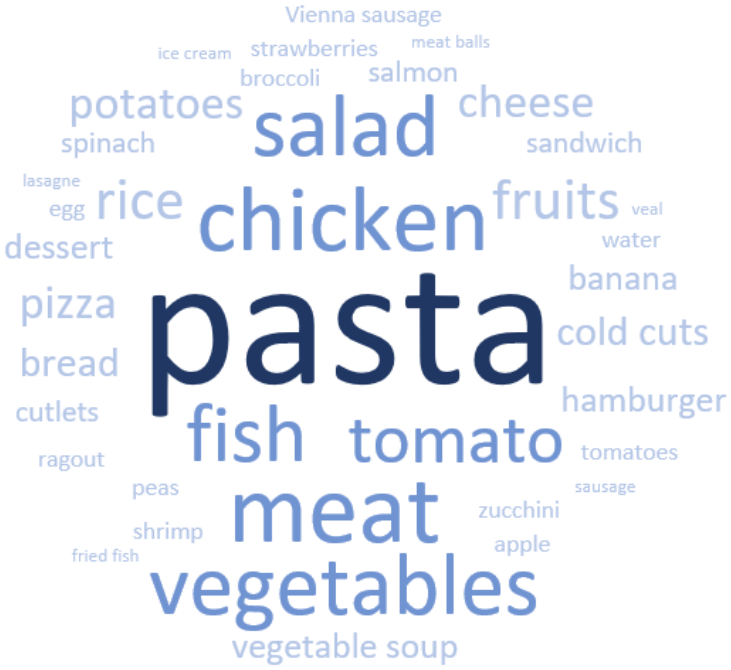


Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

c) Breakfast

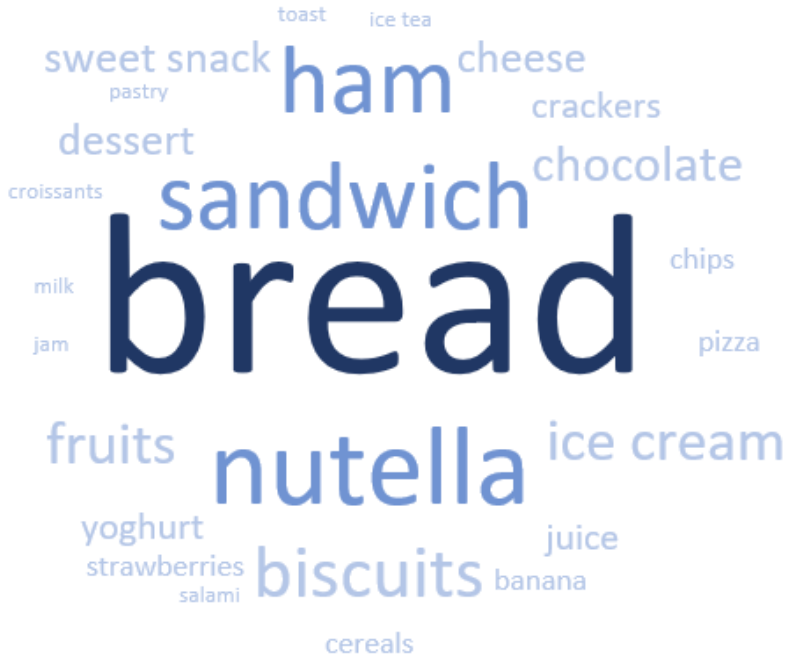


d) Dinner

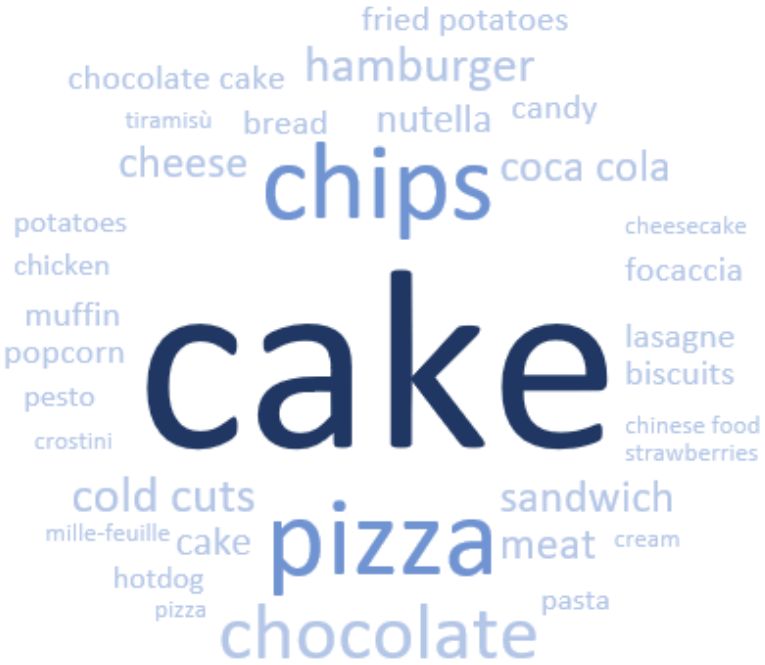


Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

852 e) Snack



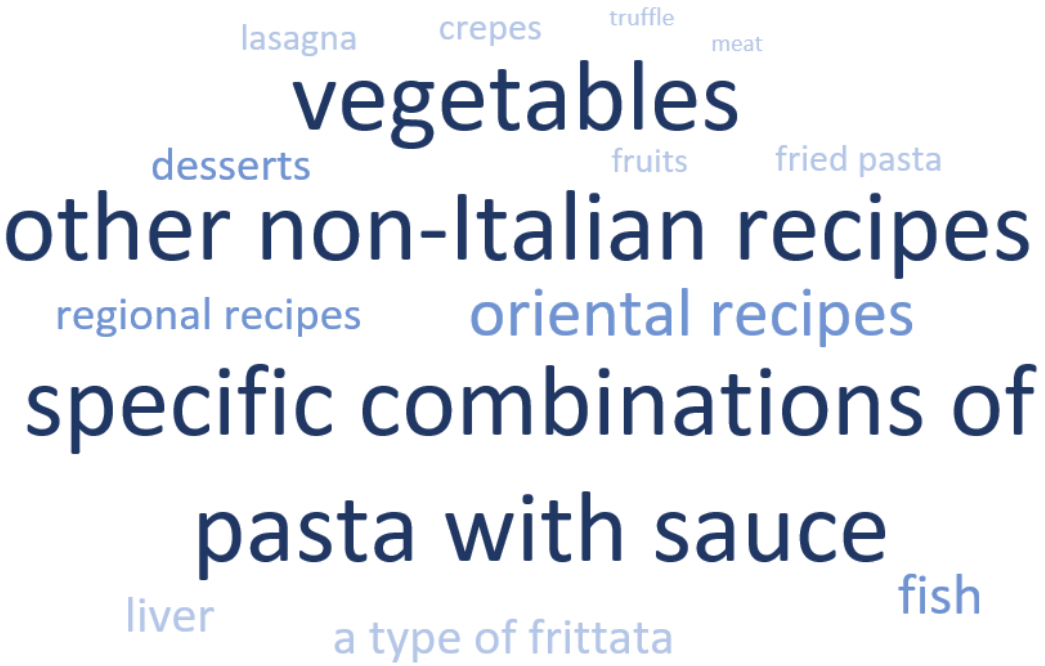
853
854
855
856 f) Birthday



857
858
859
860
861
862
863
864
865
866

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

867 g) Novel food



868
869
870
871

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953. https://doi.org/10.1016/j.foodqual.2020.103953

872 **Table S1.** EUQ: Total frequencies (%) and frequencies divided by genders (females and males) and age (9-11 and 12-13) of Familiarity, Frequency of usage, Social use, Motivation, Valence of emojis,
873 and Enjoyment in using emojis.

Question		Domain	Scale categories/items	Frequency (%)						
					Gender			Age		
				Total (n=96)	Female (n=41)	Male (n=55)	*p* value	9-11 (n=55)	12-13 (n=41)	*p* value
1	Did you know what emojis were before participating in this study?	Familiarity	I never heard of them	0	0	0	0.437*	0	0	**0.006***
			I had heard of them but had never used them	4	5	3		5	2	
			I had used them but only once	2	3	2		4	0	
			I use them occasionally	26	29	24		35	15	
			I use them regularly	68	63	71		56	83	
2	How often do you usually use emojis?	Frequency of usage	every day	24	29	20	0.714*	20	29	**0.007***
			a few times a week	42	27	53		33	54	
			a couple of times a month or less	20	29	13		25	12	
			never	14	15	14		22	5	
3	To whom do you send emojis?	Social use	friends	75	71	78	0.404	58	98	< **0.0001**
			siblings	32	27	36	0.323	27	39	0.223
			parents	55	59	53	0.571	45	68	**0.026**
			relatives	57	59	56	0.831	56	59	0.831
			teachers	7	10	5	0.423	2	15	**0.017**
			other	18	22	15	0.347	16	20	0.689
4	Why do you use emojis?	Motivation	they are fun	70	61	76	0.104	75	63	0.240
			I can use emoji instead of words	42	46	38	0.422	47	34	0.197
			they make my text messages more understandable	45	44	45	0.880	38	54	0.131
			to save time when sending messages	25	27	24	0.721	27	22	0.551
			they highlight a part of the message	23	32	16	0.077	22	24	0.767
			they express something I normally can't describe in words, e.g. how I feel	45	49	42	0.497	38	54	0.131
			they are quick to use	26	29	24	0.534	27	24	0.750
5	Do you use more emoji with positive or negative meaning?	Valence of emojis	positive	72	76	69	0.482	69	76	0.482
			negative	4	7	2	0.182	5	2	0.465
			almost the same	17	12	20	0.310	13	22	0.230
			I don't know	7	5	9	0.432	13	0	**0.018**
6	How much do you like using emojis?	Enjoyment	by no means	1	0	2		2	0	
			a bit	2	2	2		2	2	

			so and so	7	5	9	0.255*	5	10	0.164*
			fairly	25	22	27		20	32	
			a lot	65	71	60		71	56	

874 Depending on data analysis *p* values refer to Kruskal Wallis (*) or Chi-square test. In bold *p* values ≤0.05.

Please cite as:
Sick, J., Spinelli, S., Dinnella, C., & Monteleone, E. (2020). Children's selection of emojis to express food-elicited emotions in varied eating contexts. *Food Quality and Preference*, 103953.
https://doi.org/10.1016/j.foodqual.2020.103953

875